U. S. FOREST SERVICE

RESEARCH NOTE LS-66

LAKE STATES FOREST EXPERIMENT STATION • U. S. DEPARTMENT OF AGRICULTURE

Super-Spruce Seedlings Show Continued Superiority

White spruce (*Picea glauca* Moench.) seedlings, selected on the basis of superior nursery performance, have maintained their height growth advantage over average 2-2 nursery stock after 7 growing seasons in the field. The "super-spruce" also show less damage from late spring frost than the average stock.

In the spring of 1956, 357 outstanding 2-2 white spruce seedlings were lifted from the transplant beds of the Consolidated Papers Inc. nursery near Monico, Wis. The seedlings were originally grouped into 18-, 19-, and 20-inch classes and were about 1 foot taller than the average 2-2 seedling. Average seedlings from the same bed were randomly selected and paired with each of the outstanding seedlings. These 357 pairs were planted in a permanent test plantation on a nearby Consolidated Papers Inc. Experimental Forest.

Total height and height growth were measured at the end of the 1961 and 1962 growing seasons. At the time of the 1962 height measurements the presence or absence of 1962 frost damage to the terminal shoot was noted. In 1964, following a late spring frost, damage to all new shoots was scored. In the frost damage scoring each tree was assigned to one of five frost damage grades: Grade 1 with 0-20 percent of the new shoots damaged; Grade 2 with 21-40 percent new shoots damaged; Grade 3 with 41-60 percent damaged; Grade 4 with 61-80 percent damaged; and Grade 5 with 81-100 percent damaged.

Since differences between 18-, 19-, and 20-inch classes of "super-spruce" could not be shown, the three classes were grouped for the analyses. Results of all measurements are shown in table 1. Mortality as of 1962 is based on all 357 pairs, but height, height growth,

TABLE 1. — *Height, frost injury (275 living pairs), and survival (357 pairs) of super- and average spruce seedlings field planted in 1956*

Seedling group	Height 1963	Height growth		Frost injury[1]		Total mortality 1956-1962
		1961	1962	1962	1964	
	Feet	Feet	Feet	Percent	Percent	Percent
Super-spruce	3.80	0.64	0.62	11	56	16
Control	2.59	.49	[2].50 (.43)	20	66	12
Least significant difference at .01 level	.27	.06	.06	8	6	([3])

[1] *The 1962 data are the percent of trees with the terminal shoot damaged. The 1964 data are the average percent of all new shoots injured by the 1964 spring frost.*

[2] *Includes only trees with no 1962 damage to terminal. Number in parentheses includes all trees.*

[3] *No significant difference.*

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and frost damage data are based on the 275 pairs in which both trees are living.

In 81 percent of the living pairs the selected "super-spruce" seedling was taller than the control, and the "super-spruce" as a group were more than a foot taller than the controls. Moreover, in both 1961 and 1962 the outstanding seedlings made greater height growth than the controls. This suggests that the "super-spruce" should retain their superiority for some time to come.

In 1962 twice as many control trees as selected trees showed frost damage to the terminal shoot. In 1964 the control trees also showed greater overall frost damage to all new shoots. Undoubtedly, this repeated frost damage will have an adverse effect upon tree form.

There are small negative but significant correlations between height and frost damage within both the "super-spruce" group ($r = -.59$ with 273 degrees of freedom) and the control group ($r = -.46$ with 273 degrees of freedom). There is no obvious explanation for these correlations. Perhaps both height and frost damage are related to a third variable such as date of flushing. This would require further investigation. It is clear from table 1, however, that the "super-spruce" do not owe their superiority to reduced frost damage. For even when the frost-damaged control trees are eliminated from height growth computations, the "super-spruce" are out-growing the controls.

In any event, the data indicate that selecting rapid-growing seedlings yields rapid-growing saplings and, whether this growth advantage is maintained or not, the selected seedlings should produce better formed trees through reduced frost damage.

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JAMES P. KING, Associate Plant Geneticist
HANS NIENSTAEDT, Principal Plant Geneticist
Lake States Forest Experiment Station
JOHN MACON, Research Forester
Consolidated Papers Inc.
Rhinelander, Wisconsin